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INSTANTANEOUS SHUTTERS.

BY ELLERSLIE WALLACE.

The great chemical advances in modern photography as seen in the Gelatine Plate, and many departments of permanent printing processes have so absorbed the attention of the regular readers of our photographic literature, that it might at first seem strange when we say that an immense amount of mechanical thought and skill has also been expended upon those forms of apparatus which have been rendered necessary by plates of the high rapidity, now in general use.

No sooner was the fact fairly established, that cameras and plate-holders had to be "light-tight" in a sense never before understood, than it also became manifest, that, with plates of from twenty to fifty times the rapidity of the best Wet Collodion, special mechanical contrivances were necessary to give an exposure short enough for certain kinds of work. Instantaneous photography had, indeed, been largely practiced before Gelatine was ever thought of, and certain forms of shutters and drops were well known, so that the subject had been partially studied. But no sooner had the Gelatine Plate been shown to be successful, than the journals were fairly deluged with plans for drops and quick shutters of every description.

The form known familiarly as the "guillotine" drop, so named from its general resemblance to the terrible instrument of death with which all are more or less acquainted who have read the history of the French Revolution, has certain advantages, particularly those of simplicity and cheapness, which has enabled it to hold its own among all the newer and more complicated forms. It is made as follows: a strip of well-seasoned wood, say a foot or less in length, has a round hole cut near to one end just the size of the lens hood, so that it will remain *in situ* when slipped on to the hood of the lens. A tin cover is now made, somewhat longer than the wooden strip, with the sides neatly turned over so that it is free to slip up and down on the wood without friction, and yet fit tight enough to prevent the passage of light. In the middle of the tin cover a hole is now to be cut, either square or oblong, depending upon the length of exposure required. The hole, of course, must be rather larger than the diameter of the lens, so that when it passes the lens, the lens may be fully uncovered and the full amount of light utilized. A cross piece at the top of the tin cover prevents it from falling entirely off the wooden guide, and while waiting for exposure, the tin may either be held up by the finger, or a trigger arrangement may be applied. It is well also to adapt either a spring or a soft bed of some sort to the falling part, so that when it comes to rest after falling, the jar may not be so excessive as to run the risk of injuring the lens. Both the tin and the wood should be daubed with a *dead* black varnish.

As it would require a large volume to describe the different models of instantaneous drops, we will confine our remarks to the various modifications of this one.

The drop, just as we describe it, will

answer for many subjects where the highest speed is not required. We have already alluded to the opening in the tin as being square when the shortest exposure is desirable. It would not do to make the opening broader than long, for in this case, the drop standing *before the lens*, the full power of the latter could not be brought to bear. If more speed be required than is obtainable with the square opening, a rubber band may be stretched from the tin to some point on the wood-work, so that when the drop is raised the gum is put on the stretch. This increases the rapidity of the fall in a very great degree. Where longer exposures are admissible, the opening in the tin may be oblong in form. Another favorite shape for the opening, and one which has certain theoretical points in its favor, is that approximating to an hour glass. In this form the edges and corners of the plate receive a trifle longer exposure than the centre, which with most lenses is a great advantage, the illumination being strongest in the centre, and gradually weakening towards the edges. A drop with an opening of this shape, and a pneumatic trigger, may be considered a very complete instrument. If the bulk and weight of the tin cover as described be objected to, the wooden guide may be lengthened a little and supplied with a groove on each side, in which a flat sheet of metal or ebonite with the proper opening, plays up and down. The traction bands and pneumatic trigger may likewise be applied here.

It is plain that if the whole arrangement as described, be turned horizontally instead of vertically, and springs be applied to serve as the motive force, the working will be essentially the same — rather more accurate, in fact, for when using the vertical drop without bands, the wind or friction will often lengthen the exposure materially. A newly made drop could hardly be expected to bear a hot sun when first taken out into the field without more or less warping. This would not have to be taken into account in the horizontal model.

We have referred to the drop as being placed before the lens. This is undoubtedly the favorite and most usual position, but the question has often been raised whether it is the *best*. We have seen very neat drops arranged to fall in a slit in the lens jacket close to the central stop, but apart from the saving in bulk we cannot see any great advantage in this form. The most rational, though perhaps not the most convenient, position for the drop we believe to be *inside the camera*, and as near to the plate as possible. The opening in the drop may in this case be reduced in breadth so as to give the maximum of rapidity and yet not interfere with the working of the lens in the slightest degree. If the opening were thus narrowed when *before* the lens, it would be equivalent to a diaphragm, cutting down the light very much, while in the former case the full power of the lens acts on the plate even if the opening be so narrow that the whole plate is not exposed at one time; because every point of the photographic image is the focal point or apex of a cone of rays where the base is the diameter of the lens itself. The importance of this optical truth was some time since perceived by Mr. A. S. Barker, of Philadelphia, who has obtained a patent on the apparatus in which the principle was successfully applied. Other patents of a similar nature are now pending, and it is probable that the photographers will soon have an instrnment of this kind in convenient form at a reasonable price. Being enclosed in the camera, moreover, it is protected from wind and sun, and the exposure may be made without the knowledge of the bystanders—a point of some value when working in a crowded locality. The presence of the drop in the camera is useful, too, in another respect; it cuts off any false reflections from the sides of the camera, from the edges of the lens, etc., etc., and thus materially improves the brilliancy of the image. Let any one focus his camera and make ready for exposure, and then uncapping the lens, examine the interior of the box with the cloth well secured over his head. Our word for it, he will see

many parts of the wood work *supposed* to be non-reflecting sending off a dull glare of light, and a general misty sheen in the camera body. Some of the best landscape photographers knowing this, used to adapt a sort of large diaphragm of card covered with black velvet to the interior of the camera; others, again, lined the whole interior with velveteen or black cloth with a long nap. Of course, the shutter standing close to the plate as we describe obviates all this trouble, and yet retains all the advantages.

By the aid of this shutter, whose trade name is the Barker Focal Plane Shutter, the full credit of which belongs to Mr. Barker, some most extraordinary views of trotting horses, running and leaping children, etc., showing full detail in the dark parts (clothing, etc.), have been very successfully made. A bicycle rider was also one of the subjects, and the exposure, from careful calculation, could not have exceeded 1-130th of a second. These pictures were on exhibition at the Buffalo Convention, and were greatly admired. It is a most important aid to the dry plate worker desirous of making instantaneous *pictures*, *i. e.*, a good, well brought out image, and not the mere silhouette of black and white so often seen. We desire particularly to revert to the fact that it is owing to the *position in which the shutter stands* that the slit or opening may be made so much smaller than would be possible in any other position; hence the great rapidity. Several of our contemporaries have spoken in very flattering terms of this instrument. Mr. Inglis, of Rochester, on whose plates we believe the pictures were taken, was much pleased with the results. Another very uncommon attempt was made on a crowd of people throwing their hats up into the air; those in the air appearing just as sharp and well defined as those firmly placed on the heads of their owners.

If you intend to do a mean thing, wait till to-morrow. If you are to do a noble thing do it now.

Philadelphia Photographic Society.

Minutes of the regular meeting held Wednesday evening, September 2d, 1885, Mr. John Carbutt in the chair.

The questions in the Box were as follows:

1st. When using a long focus lens, is not the length of the draw of the camera more nearly the same in focusing near or distant objects than when a short focus lens is used?

With either lens the difference in draw is slight, unless the object is very near and the image of the object large in proportion to its actual size. The nearer the object and the larger its image, the further from the lens will the plate have to be drawn, whether a long or short focus lens is used.

Supposing in each case the image of the same object is to be reduced to a certain fixed size with each lens. If to do this, one lens requires a draw of say one-fourth more than its focus for distant views, the other will also require one-fourth more draw, and this, with a long focus lens, would of course be more in actual measurement than with a short one.

2d. How can you get a warm red or brownish tone on a wet collodion slide?

As a rule, the color of a slide depends greatly on the relative length of exposure, a long exposure tending to give the reddish tones. Much depends upon the condition of the silver bath, which must be in perfect order.

It was recommended to use a thick collodion; also to tone with a weak, lemon-colored solution of sulphuret of potassium.

Mr. Carbutt presented the Society with a window transparency, representing General Grant's cabin in Fairmount Park. The transparency was made on one of his Gelatino-Albumen Opal Plates.

Mr. A. J. Cassady, representing the Eastman Dry Plate and Film Co., who was present, showed a number of paper negatives and prints from the same; also the apparatus made by his company for exposing the paper in the camera by means of a holder contain-

ing sufficient paper to take twenty-four successive pictures.

The holders can be adapted to any camera. The paper is stretched between two rollers at either end of the holder, and passes over a board which holds it perfectly flat and in proper position when the slide is drawn.

After making an exposure, by means of a key attached to one of the rollers, a fresh portion of the paper is brought into position, and so on until the supply is exhausted. The holder occupies the same space as three ordinary double holders, while it contains paper for four times as many negatives. The advantage in regard to weight and bulk is, of course, obvious.

Mr. Cassaday demonstrated before the Society the ease with which a paper negative could be developed. By first wetting it thoroughly with water, there was no difficulty in handling the paper. As the film naturally adheres more firmly to paper than to glass, the danger of frilling is obviated.

In regard to fixing, owing to the paper backing of the film, perhaps it is not quite so easy to tell when the hypo has done its work, but close observation shows plainly a decided increase in the translucence of the negative when entirely fixed.

After thorough washing, the negative is laid face downward on a piece of glass, and a squeegee passed over its back to remove all the moisture possible. It is then turned face upward and laid on the glass or any other smooth surface to dry. If done in this way it is said that it will dry perfectly flat.

When dry the negative is passed through a bath of hot castor oil, the surplus oil being wiped off with a cloth and when dry it is ready to print from.

A valuable advantage possessed by paper negatives is the ease and rapidity with which they can be retouched. Cloud effects can be readily produced—the light portions by the brush or stump, and the dark effects by partly rubbing away the paper backing of the film.

As showing how completely any effect of grain in the paper is overcome, a lantern slide made from a paper negative was shown. When thrown on the screen the result was as perfect in this respect as if a glass negative had been used. The slide was made by reduction in the usual way, by means of a North light, acting directly through the negative.

Some lantern slides by Mr. Croughton, representing Louisiana scenery, were shown, also some by Mr. W. D. H. Wilson. Adjourned.

Robt. S. Redfield, Secretary.

ACTINISM.

(Continued.)

We have thus actively noticed some of the leading actinic effects of light. How are these effects produced? This question brings us face to face with the other questions: What is the mechanism of light? What is the ultimate constitution of matter? We have no difficulty in accepting the undulatory theory of light so clearly set forth by Sir William Thomson a few days ago. Let us assume in round numbers that eight hundred million million of undulations per second of the hypothetical ether, that pervades all space and all matter, produce the sensation of violet and four hundred million million produce that of red; that beyond violet there are other undulations still more rapid, and below red slower ones, neither of which report themselves to us as light, that do not affect the retina of the eye. These wavelets beat upon the sensitive compounds we have been considering; these are composed of groups of atoms called molecules; these molecules are shaken until each one looses an atom or two, new groups of atoms, new molecules are formed—that is, a new substance is formed. It may have a color different from that of the original, perhaps as sub-chloride of silver, or different attractive properties, as the changed iodide for mercury in Daguerre's process, or for silver just reduced from its solution as in the ordinary collodion process. We are surprised sometimes at the rapidity of the action of light at the so-called instantaneous photographic effects; the pictures of animals in motion, of bombs burst-

ing in air, etc. Let us look at these in the light of our theory, and maybe we will find that after all these effects are rather slow. I now call your attention to a photograph, upon the screen, of sparks of a Holtz machine. I have selected this because these sparks are of shorter duration than that any instantaneous drop or slide could be made to give. They impressed themselves upon an ordinary collodion plate in the camera as they passed. Suppose we assume $\frac{1}{20000}$th of a second at the time, and we will certainly be within bounds. That is a fraction difficult to comprehend. Sir William Thomson told you a few days ago, that it was easy to understand large numbers, just as easy as to comprehend a million-million as a million, that it is the negation of infinity that is difficult to understand. But this small fraction will trouble us. Our mental dividing engine fails in performance as we work toward zero. The twenty-thousandth of a second is so small that it eludes our mental grasp. Now astronomers when wrestling with celestial distances, frequently resort to artifices to bring them within the range of comprehension. They fire imaginary cannon-balls at the sun, and convert the vast distance into time by calculating the du ration of its flight at its greatest velocity; again they build imaginary railroads to the fixed stars, and calculate the generations that will be born and perish before the train reaches its destination, or to bring the matter down still nearer the ordinary apprehension, they calculate the fare, and state it in terms of the national blessing as a unit, and thus put it on a dollar and cent basis, and we ourselves to be persuaded that we have mastered the difficulty. Now without resorting to any artifice, without changing the character of our phenomenon, but simply looking at it from another point of view, let us regard the effect as a space effect of light instead of a time effect. Light has a velocity in round numbers of one hundred and ninety thousand miles per second, that would be one hundred and ninety miles in one-thousandth of a second, nineteen in one ten-thousandth, or say ten miles in our one twenty-thousandth of a second. Ten miles of light drive in upon our plate in that time; or if we held the corpuscular theory of light of Newton, a chain of these little pellets ten miles long would have delivered themselves upon the sensitive surfaces. Ten miles is comprehensible, one mile is, so that we could easily conceive of an effect in one-tenth of the time allowed to our electric sparks. But let us take another look at it.

Light is not corpuscles, but undulations, tiny wavelets, riplets of ether, eight hundred million million in a second for violet, a number we can easily understand, as Sir William Thomson has told us; that would make eight hundred thousand million in one-thousandth, eighty thousand million in one ten-thousandth, or forty thousand million impulses striking upon our sensitive molecules in our one twenty-thousandth of a second. Surely that number should produce an effect. We can readily conceive that one thousand million wavelets might produce an appreciable effect. They would only represent one-eight hundred thousand of a second, say one-millionth of a second. That would seem, then, to be ample time to produce a photographic effect. Theoretically, we would hardly fix it as a limit of photographic sensitiveness, an encouragement certainly to instantaneous photography; for, although the light of the sparks was intense, the waves sent out by it have great amplitude, the plate that they have impressed is comparatively insensitive, not such as we would employ ordinarily to receive an instantaneous impression.

But it may be said these wavelets are very small, but so are the portions of matter upon which they operate, molecules that not only elude our grasp, but almost defy calculation, and still smaller atoms, the components of these molecules. The action of these waves of light upon matter may not, unfitly, then be compared to that of the waves of the ocean upon the shore. But to get some notion of how these wavelets may act, let us resort to a coarse mechanical contrivance that will exhibit transfer of

energy. These two balls or pendulums are connected by suspension, on this wire stretched across the stage. I cause the one to vibrate, you notice that the other ball soon begins to vibrate, and also that its motion increases. Now if you turn your attention to the first, you will notice that its motion is decreasing at the same rate that that of the second is increasing. Now the second has acquired all the motion of the first, the first has ceased moving, and now the motion begins to be returned by the second to the first. I have arranged these balls so that either is, so to speak, in a peculiarly receptive condition with reference to the motion of the other. They are pendulums of equal lengths, of the same periods of vibration. I now change the length of one, by sliding the second ball upward on its supporting cord. I vibrate the first again, the second, as you see, takes motion again; the first loses, but for a much shorter time, and in a much smaller degree. Our second ball fails to take all the motion from the first. It is not as receptive as it was before. By similar experiments with this cord, containing two balls, by varying the positions of the balls, we see that there is a jarring of the combination, a movement very dissimilar to that of our two balls at first.

Now, a luminous body transmits energy through the ether as a medium, as these balls do through the wire. The molecules of matter, composed of atoms of different kinds, may be in a receptive condition for vibrations of ether of a certain frequency, or they may be jarred, as it were, by these vibrations; atoms, or even groups of atoms, within the molecule may recognize their periods of vibration, and take up motion to such a degree as even to be thrown out. We can thus conceive of many ways in which molecular disruption could be brought about, which would mean chemical change.

But there is another phenomenon, beautiful in itself, and not only closely related to the subject in hand, but that seems to form a sort of a stepping-stone from this gross mechanical illustration to the actinic effect upon molecules. I have said that in this spectrum on the screen, far beyond the violet, there is a region of chemical activity, but of darkness, where the photographic plate is impressed long after the retina ceases to be affected. Now, if I were to pass out into this dark, ultra-violet space, this paper coated with sulphate of quinine, or other suitable substance, it would become visible, would *fluoresce*, would take up these rapid vibrations of ether, and in some way render them visible; or to express it better, would cause them to produce a visible effect.

Without taking time to perform the experiment in this way, because from the feebleness of the light it would be unsatisfactory to you, I will get an abundance of these rays by another method. This blue glass that absorbs almost totally the other rays, allows these ultra-violet rays to pass. As I insert it in the path of the light that passes through the prism, you see what portion of the spectrum it transmits. I now place this glass before the arc light (by opening a side door of the lantern), and it casts only a deep blue, feebly luminous illumination upon the objects behind us. Now, whilst Mr. Knapp holds the blue glass in position, you notice that this white cardboard appears of a deep, feebly luminous blue. I now dip my brush into a solution of sulphate of quinine, and as I draw upon the card with the brush, you see how the tracings of the brush spring out in beautiful visible lines upon the dark blue background of the card. The quinine solution reveals the presence of these ultra-violet rays; it somehow drags these rays down from the invisible into the visible portion of the spectrum, brings them within the range of retinal effect.

But now, what is equally surprising, though, on reflection, it is what we should expect, when the quinine brings these rays within the range of vision, it in so far removes them from the actinic field. In so far as they are made to affect the retina, in so far they cease to affect the sensitive plate. A photograph of this card, as it now appears in this ultra-violet light, with its luminous trac-

ings of the brush, would give you dark letters upon a white ground, just as if drawn with ink; not as dark as with ink, but still deeply shaded, as they have been photographically degraded below the ultra-violet ground on which they are formed.

We have upon the wall much larger designs, kindly placed at my disposal by Professor Henry Morton, of the Stevens Institute, of Hoboken. The two floral designs upon my left are of especial interest. The one is traced with thallene, a fluorescent substance, first isolated by Professor Morton; the other is formed of yellow paper. In the light of our electric arc lamp, the paper design is most decided. We now illuminate with our ultra-violet light, by interposing the same blue glass; the thallene design springs out in beauty from the dark ground, by degrading the light into the region of vision; the paper design becomes almost invisible, having only the feebly luminous blue light to reflect. Briefly, what is the explanation of this phenomenon, and what its bearing? The investigations of it by Professor Stokes are classical. His figure will help us. Imagine a number of vessels at rest upon a perfectly quiet sea. Suppose a series of waves, without any wind, originated by a storm afar off, propagated by the water, reaches the vessels; these will begin to swing back and forth, but in their own time, not necessarily the periodic time of the impinging waves. They would become new wave centres, sending out waves of their own period. So, in fluorescence, the molecules of sulphate of quinine, for example, struck by the rapid ethereal wavelets of the ultra-violet begin to swing; but they vibrate in slower periods, because it is their nature, and originate waves of ether of their own rate, slower than the eight hundred million million per second of the ultra-violet, but more rapid than four hundred million million, the limit of the visible spectrum at the other end. It originates, in other words, visible light; the violet is not changed into blue and yellow, it has simply produced an effect, and in so doing has ceased as such. The light that produces fluorescence is just as truly absorbed as that produces chemical effect.—*British Journal of Photography.*

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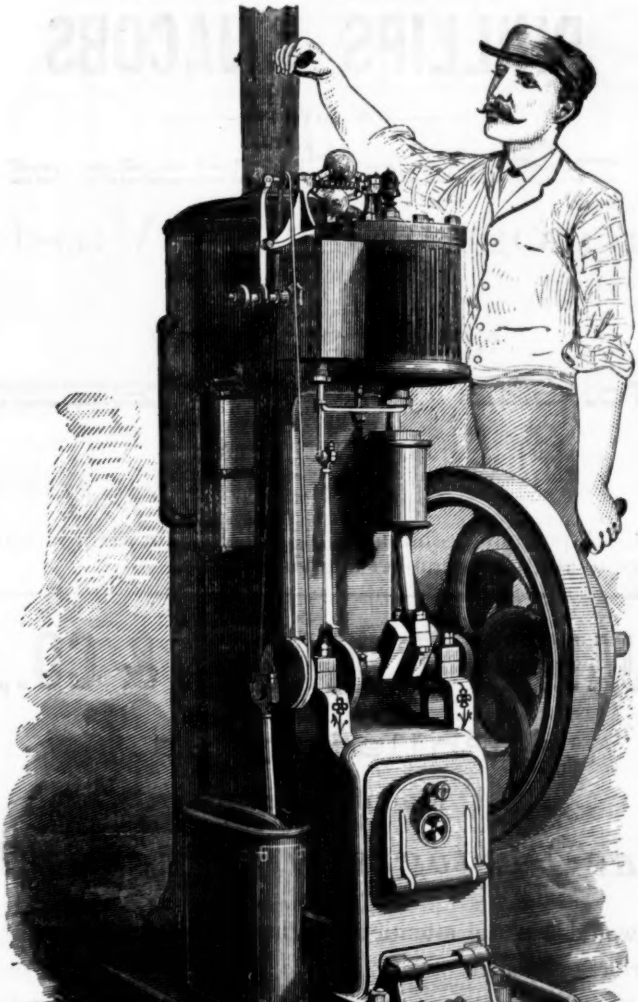

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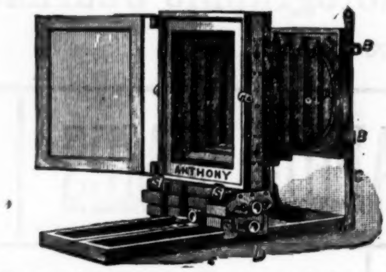
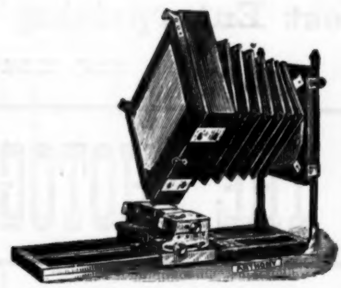


Showing Camera in position for vertical pictures.



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